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(58) Field of search
UK CL (Edition K) F2L LP
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(54) Clutch operating system including signal transmitter

(57) In a clutch operating system, a signal transmitter device (1) is connected via pressure medium in a pressure-medium circuit (5) between a clutch pedal (3) with the master piston unit (31) and the slave piston unit (41) of the clutch (4). This signal transmitter device generates a pressure signal (11) when, after a gear-change, a gear is again engaged in the gearbox causing an electromagnet (15) to be energised. This signal is transmitted via the pressure-medium circuit (5) to the master piston (32) and thus to the clutch pedal (3) as a tactile signal. To match this signal to the driver's requirements, an adjusting device (13), with which the signal strength can be regulated, is fitted to a pressure piston (12). The pressure piston may be connected to a larger piston (Fig 2) actuated pneumatically from an air reservior via a pressure reducing valve and under the control of a solenoid valve.

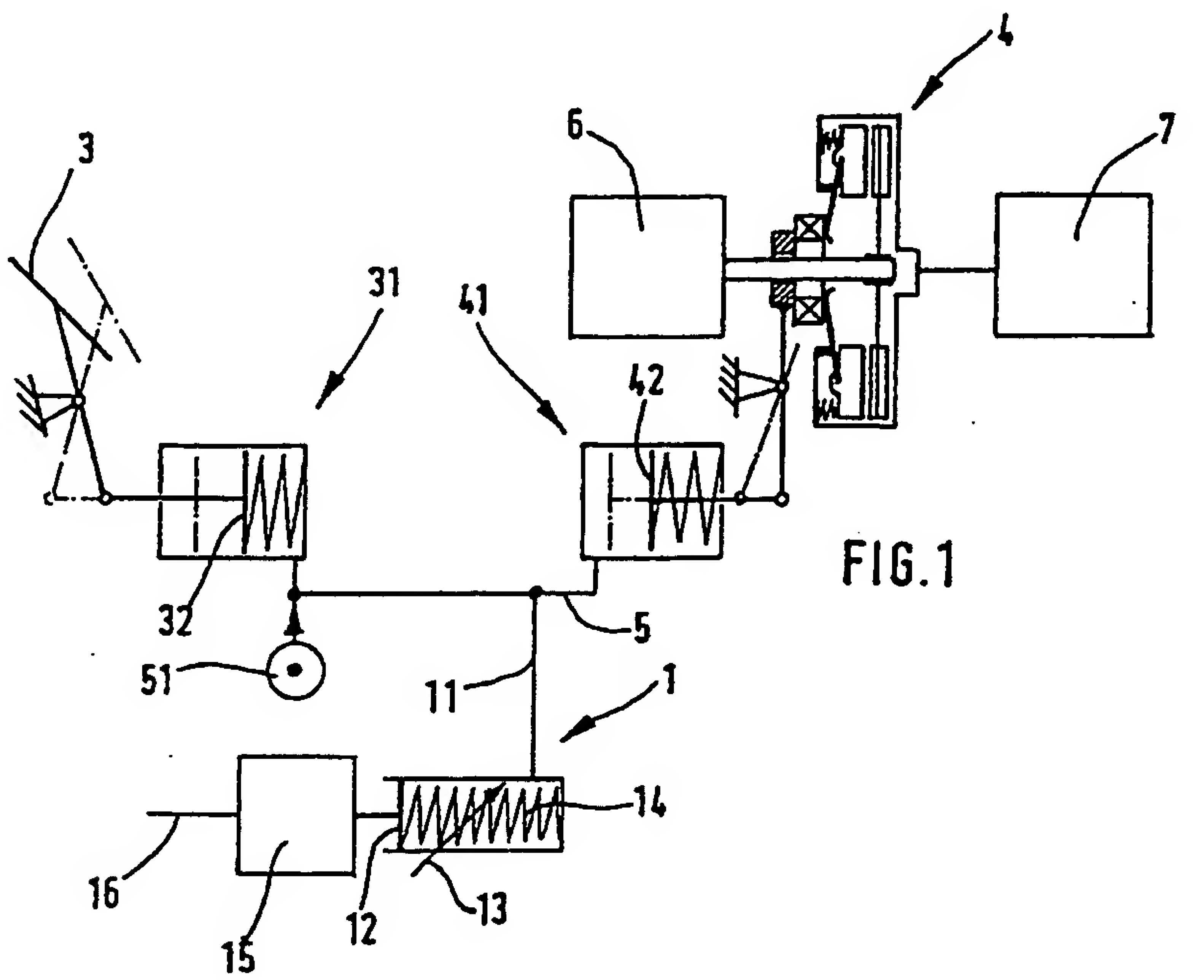

FIG.1

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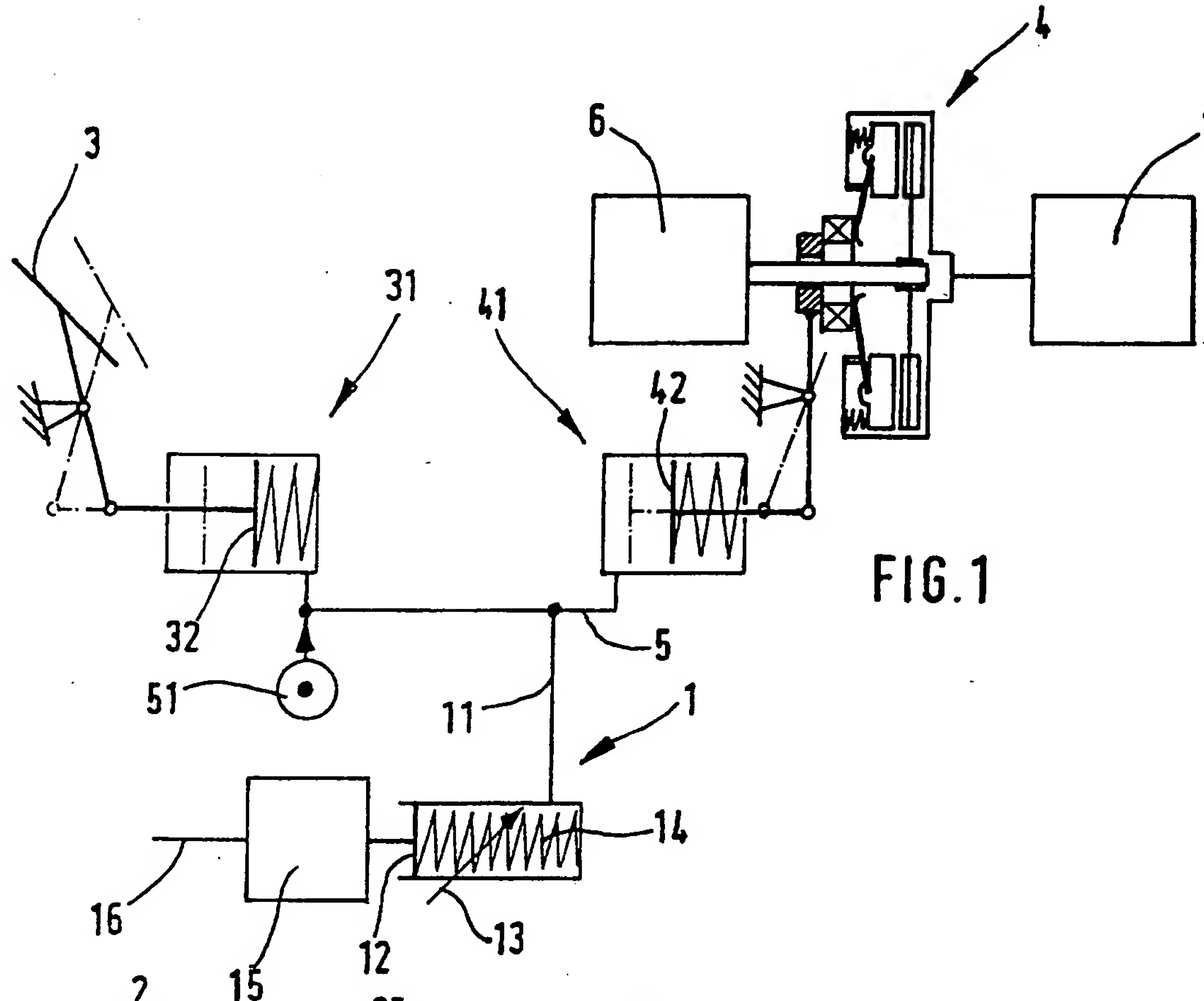


FIG.1

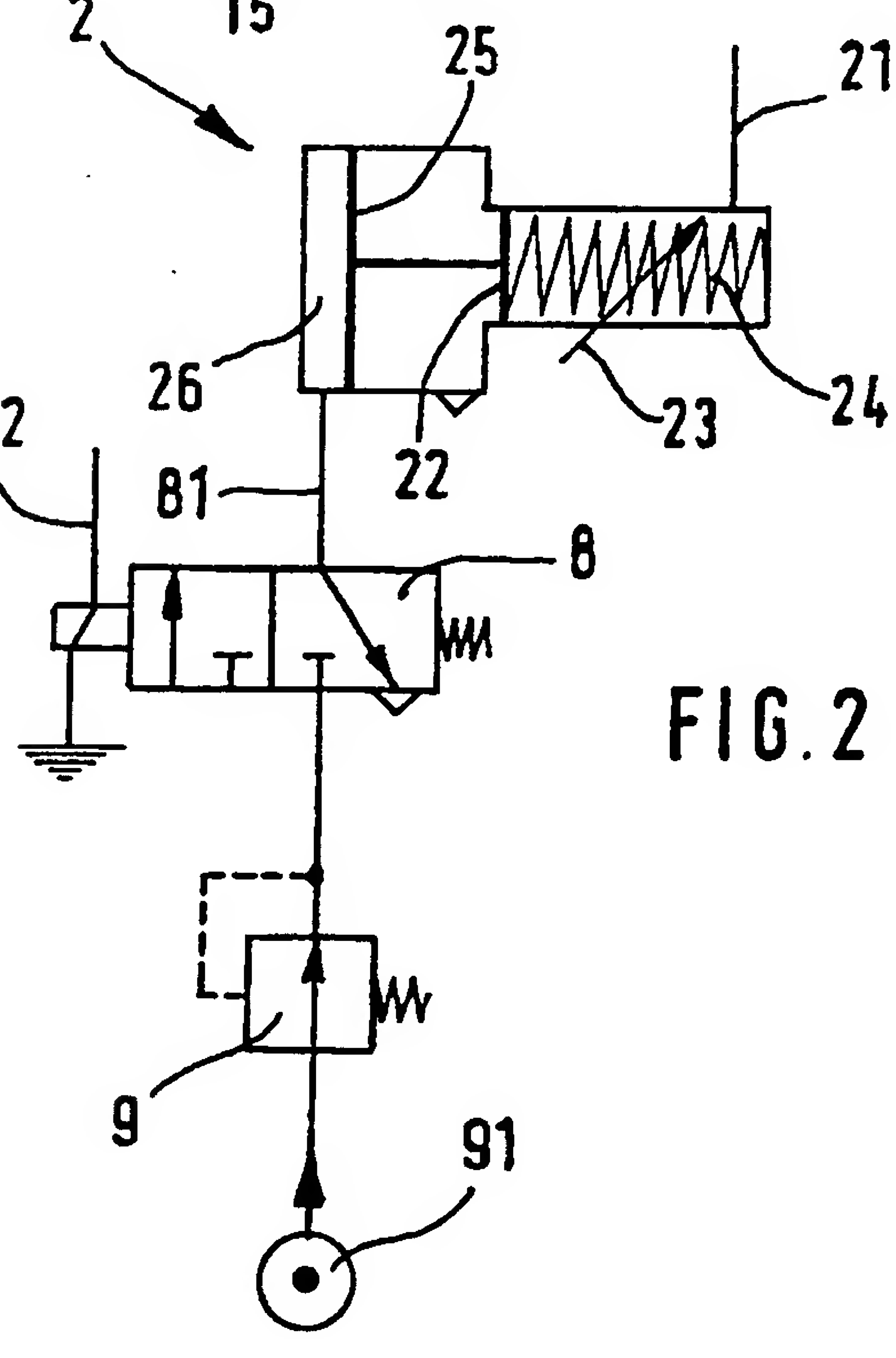
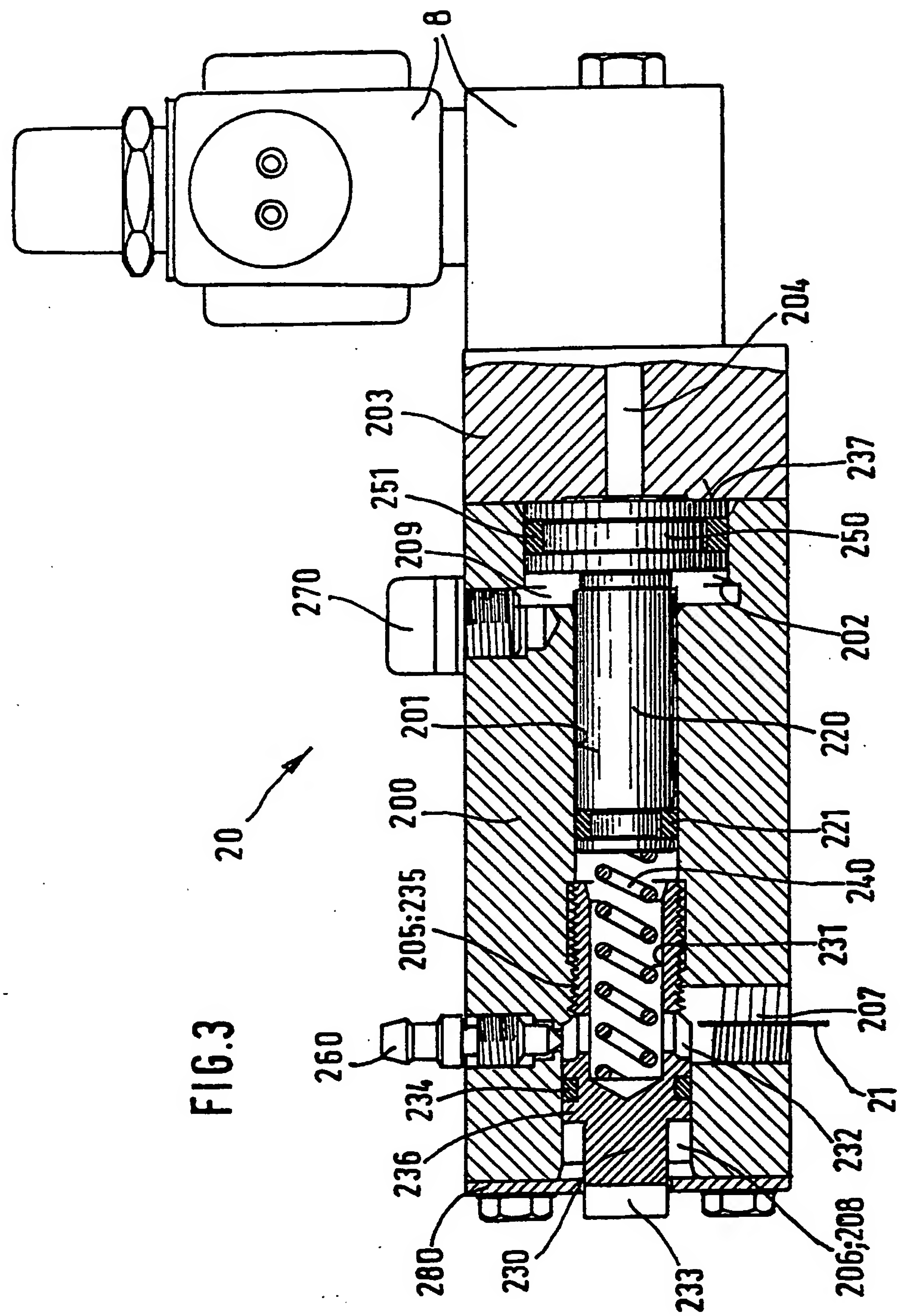


FIG.2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251
260
270
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FIG.3

SIGNAL TRANSMITTER DEVICE FOR USE WITH A VEHICLE CLUTCH

DESCRIPTION

This invention relates to a signal transmitter device adapted to be positioned between a master piston unit connected to a clutch pedal and a slave piston unit which actuates the clutch, said signal transmitter device generating a pressure signal in the pressure-medium circuit which, after a gear-change and a gear is engaged in the gearbox, is indicated to the driver as a signal at the clutch pedal.

Signal transmitter devices of this type are known which send a signal to the driver to tell him precisely when he should let out the clutch pedal. This improves the certainty of the gear-change operation because the driver can wait until the signal arrives at the clutch pedal. Consequently, a gear is always engaged when he again engages the clutch after receiving this signal. This device prevents engagement of the clutch without a gear being engaged with considerable reliability.

Despite this postive effect in relation to the gear-change operation, there are, however, shortcomings in matching the signal in relation to different vehicles, but particularly to different drivers.

The aim of the invention is therefore to improve the matching of a signal transmitter device in relation to the signal strength at a relatively low cost.

According to the invention, there is provided a signal transmitter device adapted to be positioned between a master piston unit connected to a clutch pedal and a slave piston unit which actuates a clutch, said signal transmitter device being operable to generate a pressure signal in a pressure-medium circuit connected thereto when a gear is engaged in the gearbox after a gear change, said signal being indicated at the clutch pedal, the signal transmitter comprising a pressure piston with an adjusting device by means of which the strength of the pressure signal can be regulated.

In order to precisely match the signal acting at the clutch pedal to the driver's needs, an adjusting device is preferably mounted onto the signal transmitter

constructed as a pressure piston. The pressure pulse in the signal line can in this case be transmitted to the pressure piston by purely electrical means via an electromagnet. If compressed air is available in the vehicle, then this can trigger the pressure pulse under the control of a solenoid valve. During the basic matching of the signal transmitter device to the vehicle - i.e. not matching by the driver - the spring tension of different springs can be simply used in addition to the pressure of the compressed air available in the vehicle. Whereas, according to the state-of-the-art, the adjustment of the tactile signal was only possible by regulating the pressure with the aid of the pressure-reducing valve fitted before the signal transmitter and, for example, the solenoid valve, and was usually carried out only once when matching the vehicle, the adjustment can now be simply carried out by the driver without limitations.

Since the pressure of the compressed air prior to the signal transmitter is no longer reduced by means of a pressure-reducing valve, it is also possible to reduce the diameter of the piston and thus the dimensions of the signal transmitter device. If the adjusting device

at the pressure piston is in the form of springs of differing pre-tensions, the adjustment of the tactile signal can be effected accurately and with simple means. A pressure-reducing valve between the compressed air reservoir and the solenoid valve would only be necessary in the case of severe fluctuations in relation to the compressed air reservoir.

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a schematic representation of a clutch device operated by auxiliary force, with a signal transmitter in the pressure-medium transmission line;
Figure 2 is a schematic representation of an electro-pneumatic signal transmitter device; and
Figure 3 is a cross section of an electro-pneumatic signal transmitter.

In Figure 1, a gear-changing and starting clutch 4 is positioned between a driving engine 7 and a gearbox 6. The clutch is disengaged by means of a slave piston 42 which is fitted in a slave piston unit 41. A clutch

pedal 3 is mechanically connected to a master piston 32 mounted in a master piston unit 31. Transmission of the mechanical clutch operation from the master piston 32 to the slave piston 42 is effected by means of a pressure medium, e.g. brake fluid, via pressure-medium circuit 5 which is supplied from a pressure-medium reservoir 51.

A signal transmitter unit 1, with a pressure piston or signal transmitter 12, which in the illustrated example is connected to and acted upon by an electromagnet 15, is connected to this pressure-medium circuit. The impact of the electromagnet 15 on the piston 12, and thus on the pressure medium in the pressure-medium circuit 5, is damped by a compression spring 14. This damping can be regulated by varying the pre-tension of the compression spring 14 via an adjusting device 13. It is thus possible to adjust the pressure signal in the pressure-medium circuit 5 and with it the signal at the clutch pedal 3.

The device operates as follows. If a gear is again engaged in the gearbox 6 after a gear-change, the electromagnet 15 is energized via an electrical signal in cable 16, e.g. pulse or double pulse. Via the piston 12, a pressure pulse is transmitted as a signal 11 via the pressure-medium circuit 5 to the master piston 32, so that the driver feels this signal at the clutch pedal 3. The signal 11 can be adjusted to his requirements by the driver himself via the spring 14 and an adjusting device 13 for setting the pre-tension of the spring because the signal transmitter device is made easily accessible, e.g. placed in the vicinity of the clutch pedal 3.

In a second example shown in Figure 2, the signal transmitter device 2 consists of a pressure piston 22, already known in principle from Figure 1, which is permanently connected to a piston 25 of larger diameter. Compression chamber 26 of this piston 25 is connected via a pressure line 81 to a compressed air reservoir 91 which is opened or closed via a solenoid valve 8. A pressure-reducing valve 9 can be placed between the compressed air reservoir 91 and the solenoid valve 8 merely to eliminate pressure

fluctuations. The operation of the signal transmitter device is similar to that already described in relation to Figure 1. If a gear is engaged in the gearbox 6, the solenoid valve is momentarily switched to the flow position via the line 82, so that the compressed air reaches the piston chamber 26 via the line 81. As a result, the piston 25 rapidly displaces the pressure piston 22 to the right so that a signal 21 is generated in the pressure-medium circuit 5. Further transmission up to the clutch pedal then takes place as already described.

It can be useful to open and close the solenoid valve 8 momentarily so that one or more short, successive signals acting on the clutch pedal can be felt. In particular, if the compressed air from the compressed air reservoir 91 is subject to large fluctuations, constant pressure can be achieved in the compressed air line 81 by means of a pressure-reducing valve 9. Nevertheless, in the case of such difficulties, a uniform signal can be obtained at the clutch pedal 3 in accordance with the setting on the adjusting device 23.

A possible constructional form of a signal transmitter device 20 is shown in Figure 3. A suitably-shaped bore 201, 202 is provided in a housing 200 to accept a stepped pressure piston 220/250. The end face of the large bore 202 is closed by a plate 203 having a central compressed air channel 204 therethrough, which corresponds to the compressed air channel 81 in Figure 2. The solenoid valve 8 is flange-mounted to the housing 200 of the signal transmitter device 20. In an axial elongation, in addition to the guide for the pressure piston 220, the smaller-diameter bore 201 has a thread 205 and a cylindrical seal 206 to accomodate axial displacement of and for sealing an adjustable piston 230 for the adjusting device. This elongation has an axial bore 231 to take a compression spring 240 and cross bores 232 in the axial plane in the housing 200 for the connection 207 for the signal line 21, which is connected to the pressure-medium circuit 5 (Figure 2). A vent 260 for the inner bore 231 in which the spring 240 is housed, is provided in the housing 200 in the same plane. The adjusting piston 230 has an axially projecting adjusting device 233, preferably with a slot in it, so that the adjusting piston can be turned by means of this slot using, for example, a coin

or a screwdriver. Due to the thread 235 on the adjusting piston 230 and the thread 205 on the housing 200, the piston 230 can be rotated and thus adjusted axially. The pre-tension of the spring 240 can be set by this adjustment. In the vicinity of inner space 208, the adjusting piston 230 has a shoulder 236 and a seal 234. The front face of the inner space 208 in the housing 200 is covered by a plate 280 through which the adjusting device 230 projects. Seals 221 and 251 are also fitted to both the small and large pressure pistons of the stepped piston 220/250. The chamber 209 is evacuated via a generally known vent 270 when the large piston 250 moves in relation to a pressure pulse on the piston face 237.

The mode of operation of the signal transmitter device 20 is as follows. The inner space - bore 231 - in which the compression spring 240 is housed, is always connected to the pressure-medium circuit 5 (Figure 2) containing, for example, brake fluid, via the signal line 21 and the connection 207. The piston face 237 of the pressure piston 220/250 is pressed against the plate 203 by this pressure and the pre-tension of the spring 240. If a gear is again engaged in the gearbox

6 after a gear-change, compressed air is released via the solenoid valve 8 so that the piston face 237 of the piston 250 is pressurized via the channel 204. The compressed air pressure pulse, defined for example via an electronic device, and controlled by the solenoid valve, is transmitted via the piston 220 to the pressure medium in the bore 231 and via the connection 207 and the signal line 21 to the pressure-medium circuit 5 and, as already described, via the master cylinder 32 to the clutch pedal 3 in the form of a sensible signal. The compressed air pressure pulse transmitted to the pressure piston 220 is damped by the spring 240. If the strongest possible signal is to be obtained, then the adjusting piston 230 has to be screwed out as far as possible at the plate 280, e.g. as far as the shoulder 236. On the other hand, a relatively small signal can be obtained with a large amount of damping if the adjusting piston 230 is, for example, screwed up to the stop in the opposite direction, that is in the direction of the piston 220. When filling the system with pressure medium, venting of the inner space - bore 231 - is effected in the known manner via the bleed screw 260, as in the case of any braking system. To avoid uncontrolled damping when

the signal transmitter device is operated, a generally known vent screw 270 is fitted in conjunction with this space.

CLAIMS

1. A singal transmitter device adapted to be positioned between a master piston unit connected to a clutch pedal and a slave piston unit which actuates a clutch, said signal transmitter device being operable to generate a pressure signal in a pressure-medium circuit connected thereto when a gear is engaged in the gearbox after a gear-change, said signal being indicated at the clutch pedal, the signal transmitter comprising a pressure piston with an adjusting device by means of which the strength of the pressure signal can be regulated.

2. A signal transmitter device according to Claim 1, wherein the signal transmitter device comprises an electromagnet and a pressure piston mechanically connected thereto to act as the signal transmitter.

3. A signal transmitter device according to Claim 1, wherein the signal transmitter device comprises a stepped pressure piston, the larger part of the piston

being movable in a compression chamber which is briefly, and preferably very rapidly, pressurized via a solenoid valve with compressed air from a compressed air reservoir.

4. A signal transmitter device according to Claim 1, wherein the strength of the pressure signal is regulated by means of a compression spring having adjustable pre-tension.

5. A signal transmitter device according to Claim 4, wherein a stepped piston is positioned in a correspondingly stepped cylinder , the piston being pressed against a stop arranged in an axial direction at the large diameter when in its non-operated position, a compression spring being positioned in an axial direction at the smaller diameter of the piston and pre-tensioned via an externally-adjustable piston.

6. A signal transmitter device according to Claim 4, wherein a stepped piston is mounted in a stepped bore provided in a housing, the stepped bore having a large diameter bore and a smaller diameter bore, the smaller

diameter bore being threaded to receive a threaded adjusting piston which can be moved axially therealong, said adjusting piston having a shoulder thereon onto which a seal is fitted, a compression spring for adjusting the damping of the adjusting piston located in a bore therein, said bore communicating with the pressure-medium circuit, the adjusting piston having an adjusting device which projects through a plate which closes off a space around said adjusting device, and a vent screw associated with the larger diameter bore and a bleed screw associated with the smaller diameter bore.

7. A signal transmitter device according to Claim 6, wherein the solenoid valve is combined with the signal transmitter device so that the compressed air channel from the solenoid valve to the signal transmitter device is located in a plate which acts as a stop for the stepped piston.

8. A signal transmitter device according to Claim 7, wherein a pressure-reducing valve is positioned between the compressed air reservoir and the solenoid valve.

9. A signal transmitting device substantially as herein described with reference to the accompanying drawings.

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